

Chapter 3

Engineer Qualification Tables

The following tables are designed to develop and test the proficiency of individual, squad, and platoon techniques at the basic, intermediate, and advanced levels for both active and reserve components. The series of combat engineer tasks or engagements in each table are intended to duplicate typical battlefield tasks under realistic conditions, against likely situations and target arrays, and within safety and resource constraints of live-fire ranges. The tables provide guidance for qualification and requirements for elements, rating procedures, and standards. Tables are to be accomplished sequentially.

SECTION I. CONDUCT OF TABLE I—INDIVIDUAL/CREW WEAPONS QUALIFICATION

Table I is designed to train each member of a combat engineer squad on his basic weapon. These tasks develop coordination skills and provide a soldier with an opportunity to identify individual strengths and weaknesses. The crew section of Table I should be conducted with an existing crew. Table I tasks (Table 3-1) are constructed so they will support the remainder of the tables.

FREQUENCY

This table will be executed semiannually. A unit commander may increase the frequency based on his unit's mission and requirements.

EXECUTION

Given the required range, ammunition, weapons, and post and unit SOPs, each soldier will qualify on his assigned weapon as per applicable FM or technical manual (TM).

Table 3-1. Table I tasks—individual/crew weapons qualification

Tasks Trained
<ul style="list-style-type: none">• Each individual qualifies with his weapon.• At least three soldiers per squad will be qualified on a minimum of three of the following weapons assigned: the M249 (squad automatic weapon [SAW]), the M60 machine gun (MG), the M240B, the M2 (.50 caliber), the Mark 19, and the AT4.• Each soldier will qualify with the hand grenade.• Tables existing for specialized equipment will be used (for example, for the combat engineer vehicle [CEV], use that table in conjunction with the EQT).

STRATEGY AND CONCEPT

All soldiers will qualify as per applicable FM/TM. The hand grenade is the only exception; 90 percent of all soldiers assigned will have successfully negotiated the grenade course (see FM 23-30) within the past 12 months. Ninety percent of all soldiers assigned will have thrown one live fragmentation hand grenade (FHG) within the past 24 months. Extensive preliminary marksmanship instruction (PMI) will be conducted before range qualification. Battalion/higher headquarters will provide the means to execute (such as the range, ammunition, and time). Soldiers will conduct all night firing by using assigned night-vision devices (NVDs). An AAR will be conducted.

REFERENCES

The following references will be used for this qualification:

- DA Pam 350-38.
- FM 23-9.
- FM 23-14.
- FM 23-25.
- FM 23-27.
- FM 23-30.
- FM 23-31.
- FM 23-35.
- FM 23-65.
- FM 23-67.
- TC 25-8.

SECTION II. CONDUCT OF TABLE II—LEADER DEMOLITION AND MINE QUALIFICATION

Table II is designed to qualify all leaders in the combat engineer platoon on demolitions and mines (Table 3-2). It is a hands-on, performance-oriented table that requires a leader to demonstrate proficiency in mine and demolition procedures. All leaders in the platoon are responsible for ensuring that they and their subordinate leaders successfully complete Table II tasks before executing tasks in Tables III and IV.

FREQUENCY

Team leaders through platoon leaders will complete Table II tasks within 180 days of assignment to the unit. All leaders will be qualified on Table II tasks annually. They must also complete Table II within a two-week period before executing Table III or IV. A unit commander may increase the frequency based on his unit's mission and requirements.

EXECUTION

All leaders will qualify on Table II tasks by executing the tasks using inert training aids. Leaders are expected to execute the tasks listed to standard.

Table 3-2. Table II tasks—leader demolition and mine qualification

Task	Task No.	Page
Place Timber-Cutting Charges	051-193-2015	3-4
Place Steel-Cutting Charges	051-193-2016	3-6
Place Breaching Charges	051-193-2017	3-8
Place Cratering Charges	051-193-2018	3-10
Clear a Misfire	051-193-2030	3-12
Direct a Mine-Clearing-Line-Charge (MICLIC) Loading Team	051-193-2081	3-14
Calculate Timber-Cutting Charges	051-193-3022	3-17
Calculate Steel-Cutting Charges	051-193-3023	3-19
Calculate Breaching Charges	051-193-3024	3-22
Calculate Explosive Requirements for Road Craters	051-193-3025	3-24
Prepare/Compile Nonnuclear Demolition Target Folder	051-193-3055	3-27

The following tasks must be completed before testing any squad or platoon members:

- Constructing a nonelectric initiating/detonating assembly.
- Priming explosives with detonating cord.
- Constructing detonating-cord connections/firing systems.
- Calculating/placing charges (normal/special cutting, breaching, and cratering).
- Clearing misfires (or nonelectric modernized demolition initiators [MDI]).
- Exhibiting mine-handling proficiency.
- Following established safety procedures.
- Performing a risk assessment.

STRATEGY AND CONCEPT

All senior leaders are responsible for ensuring that they and their subordinate leaders are tested and have passed the above tables. Platoons will maintain integrity while conducting each task. All risk and safety tables will come from each installation's regulations. (Range safety classes usually cover these areas.) An AAR will be conducted with the tester upon completion of the test.

TASK NO. 051-193-2015: PLACE TIMBER-CUTTING CHARGES**CONDITIONS**

You are assigned to an engineer squad that has been given a mission to emplace/clear timber obstacles. You have been tasked to place timber-cutting charges according to the instructions provided by the noncommissioned officer in charge (NCOIC). You have been given a wooden target of standing or dressed timber, explosives, and a demolition set.

STANDARDS

You will correctly place an external, ring, abatis, and/or internal charge on standing or dressed timber or on a stump.

TASK STEPS AND PERFORMANCE MEASURES

Step 1. Use an external charge placement on timber.

- a. Notch the standing timber to hold the explosive in place.
- b. Place the charge in a rectangular shape, 1 to 2 inches thick and about twice as wide as it is high.
- c. Place the explosive on dressed timber on the widest face so that the cut will be through the least thickness.

NOTE: The tree will fall over the charge unless it is influenced by the lean or the wind.

Step 2. Use a ring charge on standing timber.

- a. Place the ring charge on trees with a diameter of 30 inches or less.
- b. Place the ring charge as a band of explosives.

NOTE: The explosive must be a minimum of 1/2 inch thick for trees with a diameter of 15 inches or less and 1 inch thick for trees with a diameter of 15 to 30 inches. For trees over 30 inches, use an external timber-cutting charge.

- c. Secure the explosive to the tree.

Step 3. Use an abatis charge on standing timber.

- a. Place the explosive on the tree 5 feet above the ground (the tree will remain attached to the stump when it falls).
- b. Place the explosive on the tree so that the tree will fall at a 45-degree angle toward the enemy.

Step 4. Use internal charge placement on an internal timber-cutting charge.

- a. Place the explosive in a borehole parallel to the greatest dimension of cross section.
- b. Tamp tightly with mud.

NOTE: Use C4 or dynamite because it can be molded and tamped inside the borehole. Connect the explosive to the initiator with detonating cord.

c. Place the explosive in one borehole for dimensional timber. If the charge is too large, bore a second hole 90 degrees to the left or right of the first hole, above or below at the same depth.

d. Place the explosive at the center mass of the target for round timber. If the charge is too large, bore two holes at right angles to each other. The holes should not intersect.

NOTE: If you use two boreholes, prime them separately and fire them simultaneously.

Step 5. Place charges for stump removal.

a. Take diameter measurements at points 12 to 18 inches above the ground, if possible. If stumps are smaller, take measurements at the highest point above the ground. A stump's diameter determines the amount of explosive to be used.

b. Dig a hole in the ground next to the taproot for a taproot stump. The best method is to place charges on both sides of the taproot to obtain a shearing effect.

c. Drill sloping holes for a lateral-root stump. Place the charges under the center of the stump and at a depth equal to the stump's diameter.

NOTE: If you cannot determine the root formation, assume it is the lateral type and use tamped charges for the best results.

EVALUATION PREPARATION

Setup: Provide the soldier with the items listed in the conditions.

Brief soldier: Tell the soldier to place the charge on the target. Specify if the target is to be an external charge, internal charge, ring charge, a charge for an abatis, or a charge for stump removal. Tell the soldier in which direction the tree should fall. If a stump-removal charge is used, tell the soldier which type of stump it is (taproot or lateral-root).

EVALUATION GUIDE

Score the soldier GO if all steps are properly completed. Score the soldier NO-GO if any step is not properly completed. If the soldier does not properly complete any step, the trainer must show the soldier how to correct the mistake(s). The soldier is expected to review the task steps and performance measures and to practice the task until he performs it correctly.

REFERENCES

Required:

- FM 5-34
- FM 5-250

Related: None

TASK NO. 051-193-2016: PLACE STEEL-CUTTING CHARGES**CONDITIONS**

You are assigned to an engineer squad that has been given a mission to clear steel obstacles. You have been tasked to place the steel-cutting charges according to the instructions provided by the NCOIC. You have been given a steel target, explosives, a demolition set, and instructions on desired demolition results.

STANDARDS

You will correctly place and prime ribbon, saddle, and/or diamond charges on steel beams, rails, bars, or chain.

TASK STEPS AND PERFORMANCE MEASURES**Step 1.** Place ribbon charges.

- a. Place the charges on structural beams less than 2 inches thick.
 - Place the C-shaped charge to cut the web and half of the top and bottom flanges.
 - Place the offset-flange charge so that one edge is opposite the center of the C-shaped charge (this will cut the flange's other side).
- b. Place the charges on I-beams at least 2 inches thick, but less than 3 inches.
 - Place the C-shaped charge to cut the web and half of the top and bottom flanges.
 - Place the offset-flange charge so that one edge is opposite an edge of the C-shaped charge (this will cut the other side of the flange).
- c. Use only C4 or sheet explosives for ribbon charges.
- d. Prime charges using equal lengths of detonating cord with MDI shock-tube assemblies attached.
- e. Prime the C-shaped charge in the center and the flange charge on its outer edge. Ensure that opposing charges are never directly opposite each other (neutralizing the explosive effect).

Step 2. Place the explosive on rails.

- a. Place the explosive on railroad frogs, crossovers, and switches.
- b. Use trinitrotoluene (TNT) or an explosive with a higher relative effectiveness (RE) factor.
- c. Use 1/2 pound for rails less than 5 inches high and 1 pound for rails 5 inches high or more.

Step 3. Place saddle charges (cross-fracture method).

- a. Place charges on round, square, or rectangular milled-steel bars up to 8 inches in diameter or 8 inches square.
- b. Prime the charges at the apex of the long axis.

Step 4. Place diamond charges.

- a. Place charges on round, square, or rectangular high-carbon steel or steel-alloy bars up to 8 inches in diameter or 8 inches square.
- b. Place the charges in a diamond shape, 1 inch thick, with the short axis equal to one-half the bar's circumference.

NOTE: It is extremely difficult to place charges around corners of square or rectangular bars.

- c. Wrap the explosive completely around the target so the ends of the long axis touch. (It may be necessary to slightly increase the charges' dimensions to accomplish this.) If necessary, tape the charges to the target to ensure complete contact.
- d. Prime the charges at each end of the short axis and detonate simultaneously.

Step 5. Place the explosive on a steel chain.

- a. Use one charge if the explosive is long enough to bridge both sides of the link or large enough to fit snugly between the two lengths.
- b. Use two charges—one on each side—for large chains. Prime both charges so they will detonate simultaneously.

EVALUATION PREPARATION

Setup: Provide the soldier with the items listed in the conditions.

Brief soldier: Tell the soldier what type of target, charges, and explosives to be used. Tell the soldier to place the explosive on the target and prime it.

EVALUATION GUIDE

Score the soldier GO if all steps are properly completed. Score the soldier NO-GO if any step is not properly completed. If the soldier does not properly complete any step, the trainer must show the soldier how to correct the mistake(s). The soldier is expected to review the task steps and performance measures and to practice the task until he performs it correctly.

REFERENCES

Required:

- FM 5-34
- FM 5-250

Related: None

TASK NO. 051-193-2017: PLACE BREACHING CHARGES**CONDITIONS**

You are assigned to an engineer squad that has been given a mission to emplace/clear obstacles by breaching. You have been tasked to place the breaching charges according to the instructions provided by the NCOIC. You have been given a concrete target, explosives, a demolition set, and instructions on the desired demolition results.

STANDARDS

You will correctly place the charges on the target being breached.

TASK STEPS AND PERFORMANCE MEASURES

Step 1. Place breaching charges for the destruction of piers, walls, abutments, or slabs.

- a. Place charges against either side of the target (above, at, or below ground level).
- b. Tamp all charges with damp soil or filled sandbags equal to or greater than the breaching radius (the target's thickness).
- c. Ensure that charges submerged in water are at a depth equal to or greater than the breaching radius.
- d. Place the explosive in the shape of a flat square, with the flat side against the target (this will transmit the maximum destructive shock into the target).
- e. Use "triple-nickel-forty" for abutments 5 feet thick or less, placing 40 pounds of explosive in holes 5 feet deep, 5 feet apart, and 5 feet from the open face of the abutment.
- f. Use breaching charges in contact with the back of the abutment for abutments over 5 feet thick. Use the abutment's thickness as the breaching radius. Attempt to place charges at least 3 feet below the bridge seat (where the bridge's superstructure sits on the abutment).
- g. Place a row of breaching charges for abutments over 20 feet high. Place a row of breaching charges at the base of the abutment, on the gap side, in addition to the charges specified in steps 1e and 1f. Fire all charges simultaneously.

Step 2. Place counterforce charges on small cubical or columnar concrete and masonry targets 4 feet or less in thickness and width.

NOTE: Use C4 or sheet explosives only.

- a. Divide the amount of explosives in half and place them opposite each other.
- b. Prime the charges separately but detonate them simultaneously.
- c. Place the charges flush against the target sides.

EVALUATION PREPARATION

Setup: Provide the soldier with the items listed in the conditions.

Brief soldier: Tell the soldier the type of target to be breached, the type and amount of explosive to be used, and any measurement or other information which may influence charge placement. Tell the soldier to place the breaching charge on the designated target.

EVALUATION GUIDE

Score the soldier GO if all steps are properly completed. Score the soldier NO-GO if any step is not properly completed. If the soldier does not properly complete any step, the trainer must show the soldier how to correct the mistake(s). The soldier is expected to review the task steps and performance measures and to practice the task until he performs it correctly.

REFERENCES

Required:

- FM 5-34
- FM 5-250

Related: None

TASK NO. 051-193-2018: PLACE CRATERING CHARGES**CONDITIONS**

You are a member of an engineer squad with a mission to emplace road craters. You have been tasked to place the cratering charges according to the instructions provided by the NCOIC. You have been given a road section or avenue of approach, explosives, a demolition set, and instructions on the desired demolition results.

STANDARDS

You will correctly place cratering charges to make a hasty, deliberate, or relieved-face road crater.

TASK STEPS AND PERFORMANCE MEASURES

Step 1. Use explosives to breach hard-surface pavements. Concrete should not be breached at expansion joints because of the shattering effect.

- a. Space charges the same distance that the boreholes are to be placed.
- b. Place 1 pound of TNT or an explosive with a higher RE factor for each 2 inches of pavement thickness. Tamp charges with wet earth or filled sandbags twice as thick as the pavement.
- c. Use a shaped charge to blast a small-diameter hole through the pavement into the subgrade.

Step 2. Construct boreholes for cratering charges by digging or by using standard-shaped charges.

NOTE: Boreholes can be enlarged by using additional explosives. Ensure that the borehole has cooled before placing more explosives in the hole.

Step 3. Place explosives to construct a hasty road crater at a 45-degree angle diagonally across the road.

- a. Dig all boreholes the same depth (at least 5 feet), at a 45-degree angle, and spaced 5 feet center to center with 10 pounds of explosives per foot of depth per borehole.
- b. Dual prime all charges, connecting them with detonating cord.

Step 4. Place explosives to construct a deliberate road crater at a 45-degree angle diagonally across the road.

- a. Dig the boreholes 5 feet apart, center to center, in line across the roadway.
- b. Dig the end holes 7 feet deep and alternately dig the other holes 5 and 7 feet deep.

NOTE: The end holes must be 7 feet deep; do not dig two 5-foot holes next to each other.

- c. Place 80 pounds of explosives in the 7-foot boreholes and 40 pounds in the 5-foot holes.
- d. Dual prime all charges.

NOTE: When using the 40-pound cratering charge for dual priming, place a 1-pound block of TNT on the side of the charge.

e. Tamp all holes with suitable material.

Step 5. Place explosives to construct a relieved-face road crater.

a. Construct two rows of boreholes at a 45-degree angle diagonally across the road and 8 feet apart on dirt- or gravel-surfaced roads. Space the boreholes on 7-foot centers.

b. Construct two rows of boreholes 12 feet apart on hard-surfaced roads.

c. Stagger the boreholes in the row on the enemy's side relative to the holes on the friendly side.

d. Construct one less borehole in the enemy's row than in the friendly's row.

e. Construct the boreholes in the friendly's row 5 feet deep with 40 pounds of explosives in each hole.

f. Construct the boreholes in the enemy's row 4 feet deep with 30 pounds of explosives in each hole.

g. Prime the charges in each row separately.

h. Cover the detonating-cord firing system of the friendly's row with 6 inches of dirt. This prevents the detonating cord from being cut when the enemy's row is detonated 1/2 to 1 1/2 seconds before the friendly's.

EVALUATION PREPARATION

Setup: Provide the soldier with the items listed in the conditions.

Brief soldier: Tell the soldier to place cratering charges on the target selected. (The trainer may select any of the types of cratering charges in the task steps and performance measures.)

EVALUATION GUIDE

Score the soldier GO if all steps are properly completed. Score the soldier NO-GO if any step is not properly completed. If the soldier does not properly complete any step, the trainer must show the soldier how to correct the mistake(s). The soldier is expected to review the task steps and performance measures and to practice the task until he performs it correctly.

REFERENCES

Required:

- FM 5-34
- FM 5-250

Related: None

TASK NO. 051-193-2030: CLEAR A MISFIRE**CONDITIONS**

You are given an electric/a nonelectric initiating system that has failed to detonate the charge, detonating cord, a time fuse, fuse igniters, explosives, a demolition set, and hand tools.

STANDARDS

You will wait 30 minutes after a misfire occurs before moving downrange to investigate the misfire. However, if the misfire is a single, electrically primed, untamped charge, you can investigate immediately. After waiting the required time, you and the officer in charge (OIC) must investigate the misfired system and, if possible, determine the cause of the misfire. You will clear the misfired charge by—

- Attaching a new detonating assembly to the detonating cord that was used to prime the misfired charge.
- Placing and detonating a 2-pound charge within 1 foot of a tamped misfired charge.
- Placing a 1-pound charge next to an untamped misfired charge.
- Correcting breaks, shorts, or equipment malfunctions in electric detonating assemblies.

You will observe all safety precautions to avoid injury to personnel.

TASK STEPS AND PERFORMANCE MEASURES

Step 1. Wait the required time and watch for the following signs before moving downrange to investigate the misfire:

- a. Wait 30 minutes before moving downrange to investigate the misfire. However, if the misfired charge is electrically primed, above ground, and not dual primed, investigate it immediately.
- b. Wait until smoke or fire coming from the charge's location clears before moving downrange.
- c. Investigate as much of the MDI firing assembly as possible without leaving the firing point.

Step 2. Investigate to determine the cause and corrective action to take.

NOTE: DO NOT move either the blasting cap or the misfired cap.

- Nonelectrical firing system and MDI.
 - Check all igniters and the time fuse to determine if one of them did not burn.
 - Check the blasting cap's location to determine if the priming was inadequate.

NOTE: If the blasting cap detonated but did not initiate other shock tubes or the charge, priming was inadequate.

- System with detonating cord. Locate the primed end of the detonating cord to determine if the blasting cap detonated but failed to initiate the cord or if the fault is in the initiating assembly.

NOTE: Check for misfires after multiple charges have been detonated to ensure that all charges detonated.

Step 3. Clear misfired charges.

a. Clear tamped charges.

- Attempt to explode misfired charges that have no more than 1 foot of tamping by detonating a new 2-pound charge placed directly on top of the tamping.
- Remove the tamping of misfired charges that have more than 1 foot of tamping by using wooden or nonmetallic tools within 1 foot either above or beside the charge. Detonate a new 2-pound charge placed on the tamping.

b. Untamped charges. Detonate a 1-pound charge placed next to the misfired charge.

c. Correct equipment faults found in electrical detonating assemblies by replacing equipment and/or repairing breaks and insulating shorts.

d. Attach new detonating assemblies to detonating-cord main lines and/or branch lines at least 6 inches from the cut end of the cord.

NOTE: If detonating cord continually fails to fire, the detonating cord is defective and the charges must be primed again.

EVALUATION PREPARATION

Setup: Provide the soldier with the items listed in the conditions statement. (Not all types of systems need to be trained during the same session.)

Brief soldier: Tell the soldier to clear the misfire.

EVALUATION GUIDE

Score the soldier GO if all steps are properly completed. Score the soldier NO-GO if any step is not properly completed. If the soldier does not properly complete any step, the trainer must show the soldier how to correct the mistake(s). The soldier is expected to review the task steps and performance measures and to practice the task until he performs it correctly.

REFERENCES

Required: FM 5-250

Related: None

TASK NO. 051-193-2081: DIRECT A MINE-CLEARING-LINE-CHARGE (MICLIC) LOADING TEAM**CONDITIONS**

You are a team leader, given an order to direct a MICLIC loading team in an assembly area. You have a MICLIC launcher assembly on an M353 or M200A1, four soldiers, a trailer chassis, a sling, a towing vehicle, two adjustable wrenches, a pry bar, a linear line charge, a fuse in its container, an MK22 MOD4 rocket, TM 9-1375-215-14&P, and a lifting device.

STANDARDS

You will direct your team to load and prepare the MICLIC for deployment within 30 minutes.

TASK STEPS AND PERFORMANCE MEASURES

Step 1. Raise the launcher rail manually until the first thread on the hydraulic cylinder appears.

Step 2. Direct the crew to install the line-charge container on the launcher assembly.

- a. Inspect the container for visible damage. If damaged, follow the instructions outlined in TM 9-1375-215-14&P, Tables 6-2 and 6-3.
- b. Remove the hard cover.
- c. Attach the lifting sling and signal the lifting-device operator to lift, position, and lower the container onto the launcher. Use your team to control the swing and to guide the container into position.
- d. Remove the lifting sling and secure the container.
- e. Inspect the fuse and charge. If damaged, follow the instructions outlined in TM 9-1375-215-14&P, Tables 6-2, 6-3, and 6-5.
- f. Install the fuse and ensure that all electrical connections are made correctly and tightened to ensure good contact.
- g. Install the nylon protective cover.

Step 3. Direct the crew to install the rocket.

- a. Lower the launcher rail to about 10 degrees.
- b. Remove the rocket from the shipping container.
- c. Ensure that the front plate is secured to the head of the rocket and that the ball-lock pin is not in the head of the rocket.
- d. Inspect the rocket for dents and corrosion, (refer to TM 9-1375-215-14&P, Table 6-4). If damaged, ensure that the electrical protective cap is on the rocket motor lead and return the unserviceable rocket for replacement.
- e. Align the rocket on the launcher. Ensure that the rocket is firmly seated on the front and rear alignment pins and that there is no forward movement. Check the alignment and tightness of the four hand knobs. The bolts should

be at right angles to the rocket bands and should hold the rocket securely to the launcher rail.

Step 4. Direct the attachment of the rocket's bridle cable, ensuring that—

- a. The rocket's harness connector is pointed forward and positioned near the front of the linear demolition-charge container.
- b. The launcher rail is positioned at 20 degrees.
- c. The shock cords at the rear of the cover do not interfere with the electrical leads and bridle cable and that the bridle cable exits from the rear of the cover.
- d. The ball-lock pin is seated into the rocket's forward shipping plug to prevent rocket burnout on the rail or a partial deployment of the linear charge.

Step 5. Direct the electrical hookup and continuity checks, ensuring that—

- a. The launcher rail is elevated to about 5 degrees while making connections.
- b. All electrical connections are made and tightened.
- c. The demolition fuse kit and rocket motor are kept at least 5 feet from any low-power operating transmitter.
- d. Once tests have been made, the ball-lock pin is secured in the head of the rocket and is in the RAISE position.

Step 6. Direct the preparation of the system for deployment, ensuring that—

- a. The lead is secured to receptacle #3.
- b. The ball-lock pin is secured in the head of the rocket and is in the RAISE position.
- c. The hydraulic control-valve handle is in the PRESSURIZE ACCUMULATOR position and that the gauge pressure is pumped to 3,200 pounds per square inch (psi).

NOTE: If the towing vehicle is wheeled, omit step 6d.

- d. The selector-switch assembly and lanyard handle are transferred to the towing vehicle.
- e. The M34 blasting machine is transferred to the primary operator.

Step 7. Report to the NCOIC that the MICLIC is ready.

EVALUATION PREPARATION

Setup: Provide the soldier with all of the materials listed in the conditions.

Brief soldier: Tell the soldier to direct his team in loading and preparing the MICLIC for firing.

EVALUATION GUIDE

Score the soldier GO if all steps are properly completed. Score the soldier NO-GO if any step is not properly completed. If the soldier does not properly complete any step, the trainer must show the soldier how to correct the mistake(s). The soldier is expected to review the task steps and performance measures and to practice the task until he performs it correctly.

REFERENCES

Required:

- TM 9-1375-215-14&P
- TM 9-2330-247-14&P

Related: None

TASK NO. 051-193-3022: CALCULATE TIMBER-CUTTING CHARGES**CONDITIONS**

You are given a hand-held calculator and the information needed to calculate charges with a formula.

STANDARDS

You will accurately calculate all timber-cutting charges.

TASK STEPS AND PERFORMANCE MEASURES**NOTES:**

- 1. Always refer to FM 5-250 when calculating charges of any kind.**
- 2. The results of test shots will determine the need for increasing or decreasing the amount of explosives required for each shot that follows.**

Step 1. Calculate the amount of charges needed.

- a. Identify and measure the critical dimensions.
- b. Calculate for TNT using the proper formula.
- c. Divide by the RE factor if using explosives other than TNT.
- d. Round up to the next package size.
- e. Calculate the number of charges.
- f. Calculate the total amount of explosives (number of pounds and packages).
- g. Determine the amount of detonating cord required.
- h. Determine the amount of firing (MDI) requirements.

Step 2. Calculate for tamped internal charges using the following formula:

$$P = D^2/250$$

where—

P = pounds of TNT required

D = diameter of round timber or the smallest dimension of dressed timber, in inches

NOTE: Divide the circumference by 3.14 to calculate the diameter.

Step 3. Calculate for untamped external charges, using the following formula:

$$P = D^2/40$$

where—

P = pounds of TNT required

D = diameter of round timber or the smallest dimension of dressed timber, in inches

Step 4. Calculate for an abatis or obstacle caused by partially cut trees using the following formula:

$$P = D^2/50$$

where—

P = pounds of TNT required

D = diameter of the tree

Step 5. Calculate for stump removal using the rule-of-thumb method.

NOTE: Measure the diameter 12 to 18 inches above the ground, when possible.

- a. Use 1 pound of explosive per foot of diameter for dead stumps.
- b. Use 2 pounds of explosive per foot of diameter for live stumps.
- c. Increase the amount of explosive by 50 percent if both the tree and the stump are to be removed.
- d. Compute to the next higher 1/2-foot diameter.
- e. Determine the amount of detonating cord required.

Step 6. Calculate for ring charges.

- a. Use the external charge formula ($D^2/40$) for calculating the amount of explosives.
- b. Use 1/2-inch explosive thickness on trees up to 15 inches in diameter.
- c. Use 1-inch explosive thickness on trees with a medium to large diameter (up to 30 inches).

EVALUATION PREPARATION

Setup: Provide the soldier with information/reconnaissance reports concerning timber-cutting charges and scenarios for tamped internal charges, untamped external charges, abatis charges, stump-removal charges, and ring charges.

Brief soldier: Tell the soldier to use the information in the scenarios to calculate explosives for timber-cutting charges.

EVALUATION GUIDE

Score the soldier GO if all steps are properly completed. Score the soldier NO-GO if any step is not properly completed. If the soldier does not properly complete any step, the trainer must show the soldier how to correct the mistake(s). The soldier is expected to review the task steps and performance measures and to practice the task until he performs it correctly.

REFERENCES

Required:

- FM 5-34
- FM 5-250
- Graphic Training Aid (GTA) 5-10-33

Related: None

TASK NO. 051-193-3023: CALCULATE STEEL-CUTTING CHARGES**CONDITIONS**

You are given a hand-held calculator and the information needed to calculate charges with a formula.

STANDARDS

You will accurately determine the type and amount of explosives required.

TASK STEPS AND PERFORMANCE MEASURES

NOTE: Always refer to FM 5-250 when calculating charges.

Step 1. Calculate the charges for an I-beam, using one of the following formulas:

$$P = 3/8A \text{ or } P = 0.375A$$

where—

P = pounds of TNT required

A = cross-sectional area, in square inches

NOTE: The cross-sectional area is the flange (length x width x 2) plus the web (length x width) of the steel member to be cut.

Step 2. Calculate the charge for high-carbon or alloy steel, using the following formula:

$$P = D^2$$

where—

P = pounds of TNT required

D = diameter or thickness, in inches, of section to be cut

Step 3. Use the rule-of-thumb cutting application for rail destruction.

- a. Use 1/2 pound of explosive for rails less than 5 inches high.
- b. Use 1 pound of explosive for rails 5 inches or more in height.
- c. Use 2 pounds of explosive for frogs.
- d. Use 1 pound of explosive for switches and crossovers.
- e. Use the number of pounds of TNT that is equal to the diameter of the steel chain ($P = D$).

NOTE: If one TNT block will bridge the gap in the chain, use one charge; if not, use two blocks.

Step 4. Use the rule-of-thumb cutting application for steel bars, rods, chains, and cables.

- a. Use the following amount of explosives for materials up to 2 inches in diameter or thickness:
 - Use 1 pound for materials up to 1 inch in diameter or thickness.

- Use 2 pounds for materials between 1 inch and 2 inches in diameter or thickness.

b. Use the following formula for materials over 2 inches in diameter or thickness:

$$P = (3/8)A$$

where—

P = pounds of TNT required

A = cross-sectional area of material to be cut

Step 5. Use plastic or sheet explosives for special-purpose charges.

NOTE: One M112 is a 20-cubic-inch block and one M118 is a 9-cubic-inch sheet of C4.

- Ribbon charge.
 - Use the ribbon charge on noncircular steel targets up to 3 inches thick.

NOTE: The explosive's effectiveness depends on its width and thickness.

- Ensure that the charge's—
 - Thickness is one-half the steel's thickness. **NOTE: Charge thickness must be a minimum of 1/2 inch.**
 - Width is three times its thickness.
 - Length is equal to the length of the desired cut.
- Saddle charge.
 - Use the saddle charge for cutting round, square, or rectangular milled-steel bars up to 8 inches square or 8 inches in diameter.
 - Ensure that the charge's—
 - Base is one-half the target's circumference.
 - Thickness is equal to 1 inch (the thickness of an M112 block plastic explosive).
 - Long axis is equal to the target's circumference.
- Diamond charge.
 - Use the diamond charge on high-carbon- or alloy-steel bars up to 8 inches in diameter or square.
 - Ensure that the charge's—
 - Thickness is equal to 1 inch.
 - Long axis is equal to the target's circumference.
 - Short axis is equal to one-half the target's circumference.

NOTE: The formula to determine the volume of C4 required for a diamond charge is $1/2(\text{thickness} \times \text{short axis} \times \text{long axis of the charge})$.

EVALUATION PREPARATION

Setup: Provide the soldier with the information/reconnaissance reports and scenarios needed to calculate explosive requirements for steel demolition targets.

Brief soldier: Tell the soldier to use the information in the scenarios to calculate the explosive requirements for steel targets.

EVALUATION GUIDE

Score the soldier GO if all steps are properly completed. Score the soldier NO-GO if any step is not properly completed. If the soldier does not properly complete any step, the trainer must show the soldier how to correct the mistake(s). The soldier is expected to review the task steps and performance measures and to practice the task until he performs it correctly.

REFERENCES

Required:

- FM 5-34
- FM 5-250
- GTA 5-10-33

Related: None

TASK NO. 051-193-3024: CALCULATE BREACHING CHARGES**CONDITIONS**

You are given a hand-held calculator and the information needed to calculate explosives for the destruction of concrete slab bridges, concrete T-beams, bridge abutments, and permanent field fortifications.

STANDARDS

You will calculate breaching charges accurately using the formula or table method.

TASK STEPS AND PERFORMANCE MEASURES

NOTE: Always refer to FM 5-250 when calculating charges. The soldier must have the values of K and C.

Step 1. Calculate the size of charges required to breach concrete, masonry, rock, or similar material by using the following formula:

$$P = R3KC$$

where—

P = pounds of TNT required

R = breaching radius (the distance, in feet, from an explosive in which all material is displaced or destroyed)

K = material factor (reflects the strength and hardness of the material to be breached)

C = tamping factor (depends on the location and the tamping of the charge)

Step 2. Calculate the number of charges using the following formula:

$$N = W/2R$$

where—

N = number of charges

W = width of pier, slab, or wall, in feet

R = target's breaching radius

NOTE: If the calculated value of N is less than 1 1/4, use one charge; if it is 1 1/4 to less than 2 1/2, use two charges; if it is 2 1/2 or more, round up to the next whole number and use that many charges.

Step 3. Calculate counterforce charges as follows:

$$P = 1.5T$$

where—

P = pounds of TNT

T = thickness of the column or cube

a. Round fractional measurements to the next higher 1/2 foot before multiplication.

- b. Multiply 1 1/2 pounds (C4 or sheet explosive) by the target's thickness, in feet.

NOTE: Counterforce charges are effective against small cubical or columnar concrete and masonry objects 4 feet or less in thickness and width, but are not used on walls or piers.

EVALUATION PREPARATION

Setup: Provide the soldier with information and scenarios needed to calculate the amount of explosives required to destroy the types of targets described in the conditions.

Brief soldier: Tell the soldier to use the information or scenarios to calculate breaching charges.

EVALUATION GUIDE

Score the soldier GO if all steps are properly completed. Score the soldier NO-GO if any step is not properly completed. If the soldier does not properly complete any step, the trainer must show the soldier how to correct the mistake(s). The soldier is expected to review the task steps and performance measures and to practice the task until he performs it correctly.

REFERENCES

Required:

- FM 5-34
- FM 5-250
- GTA 5-10-33
- Soldier's Training Publication (STP) 5-12B24-SM-TG

Related: None

TASK NO. 051-193-3025: CALCULATE EXPLOSIVE REQUIREMENTS FOR ROAD CRATERS**CONDITIONS**

You are given a mission directive and information for a specific type of crater in a road at a designated location.

STANDARDS

You must calculate the explosive requirements for a road crater (including the appropriate number of boreholes and sufficient quantities of explosives to ensure that a crater is made to present an obstacle), as specified in the mission directive.

TASK STEPS AND PERFORMANCE MEASURES

NOTE: All road craters are placed at a 45-degree angle diagonally across the road.

Step 1. Calculate the explosive requirements for a hasty road crater.

NOTE: Hasty road craters take the least amount of time to construct based on the number and the depth of the boreholes; however, they produce the least effective barrier because of their depth and shape.

a. Measure the desired road width (the length of the crater obstacle), ensuring that the crater ties in with other artificial or natural obstacles at each end or side.

b. Calculate the number of boreholes required using the following formula:

$$N = (L - 16) / 5 + 1$$

where—

N = number of boreholes required

L = length of the desired obstacle (crater), in feet, measured across the width of the road

NOTE: Round fractional numbers of holes to the next higher number.

c. Determine the quantity of explosive needed for borehole construction. Each borehole must be at least 5 feet deep.

d. Calculate the quantity of cratering explosive required to satisfy the rule of thumb of 10 pounds of explosive per foot of depth.

e. Determine the quantity of detonating cord and MDI shock-tube initiating assembly. (Dual prime in cold weather only.)

Step 2. Calculate explosive requirements for a deliberate road crater. Calculations are the same as for placing a hasty crater, except for the following:

a. Alternate borehole depths from 7 to 5 feet.

b. Place two 7-foot boreholes next to each other at the crown of the road or anywhere along the line if there is an even number of boreholes.

- c. Ensure that two 5-foot holes are never placed next to each other.
- d. Ensure that the end holes are always 7 feet deep.
- e. Place 80 pounds of explosive in the 7-foot holes and 40 pounds of explosive in the 5-foot holes.

NOTE: For dual priming, place a 1-pound block of TNT on the side of the charge when using one 40-pound cratering charge.

Step 3. Calculate the explosive requirements for a relieved-face road crater.

NOTE: The relieved-face road-crater obstacle produces an obstacle that is more effective against tanks than either the hasty or deliberate craters.

- a. Measure the desired length of the crater.
- b. Determine the spacing of rows based on the road-surface type.
 - If the road surface is dirt or gravel, space rows 8 feet apart.
 - If the road surface is paved or hard-capped, space rows 12 feet apart.
- c. Calculate the number of boreholes required for the friendly side using the following formula:

$$N = (L - 10) / 7 + 1$$

where—

N = number of boreholes required

L = length of the desired obstacle, in feet

NOTE: Round fractional numbers of holes to the next higher number.

- d. Calculate the number of boreholes required for the enemy's side by subtracting one borehole from the number required for the friendly's.

NOTE: Boreholes in the enemy's row are staggered between boreholes in the friendly's.

- e. Determine the quantity of explosive needed.

NOTE: Boreholes on the friendly's side are 5 feet deep; boreholes on the enemy's side are 4 feet deep.

- f. Calculate the quantities of cratering and explosive charges required to load each borehole on the friendly's side with 40 pounds of explosive and each borehole on the enemy's side with 30 pounds of explosive.
- g. Calculate the quantity of detonating cord and MDI shock-tube initiating assemblies needed to separately dual prime each row.

NOTE: There should be a 1/2- to 1 1/2-second delay between the friendly's and enemy's rows, with the enemy's detonating first. The detonating cord on the friendly's row should be protected with a minimum of 6 inches of earth to prevent misfires from the shock and blast when the enemy's row detonates.

EVALUATION PREPARATION

Setup: Provide the soldier with the mission directive and scenarios to determine the explosive requirements for road craters.

Brief soldier: Tell the soldier to use the information in the scenarios to calculate the requirements for road craters.

EVALUATION GUIDE

Score the soldier GO if all steps are properly completed. Score the soldier NO-GO if any step is not properly completed. If the soldier does not properly complete any step, the trainer must show the soldier how to correct the mistake(s). The soldier is expected to review the task steps and performance measures and to practice the task until he performs it correctly.

REFERENCES

Required:

- FM 5-34
- FM 5-250
- GTA 5-10-33

Related: None

TASK NO. 051-193-3055: PREPARE/COMPILE NONNUCLEAR DEMOLITION TARGET FOLDER**CONDITIONS**

You are a squad leader in an engineer platoon that is engaged in combat operations. Your squad has been given the mission to prepare/compile a nonnuclear demolition target folder. You have been given a completed DA Form 2203-R and all of the information required to complete the report.

STANDARDS

You will prepare an obstacle folder that meets all of the requirements of Standardization Agreement (STANAG) 2123 as found in FM 5-250.

TASK STEPS AND PERFORMANCE MEASURES

Step 1. Prepare a demolition target folder that contains as much information, planning data, and execution data as possible. As a minimum, it should contain—

- The target's location, including—
 - A photograph showing the direction from which the target is being viewed.
 - A small-scale map showing the target and prestocked point for demolitions.
 - A large-scale map showing the target and adjacent targets.
- The location and description of explosives and equipment, including—
 - A sketch map with location and routes.
 - A sketch of prestocked points showing entrances, routes, and storehouses.
 - A list of the specific explosives and equipment necessary for the demolition.
- Orders for preparing and firing, including—
 - Orders to the commander of the demolition firing party.
 - Special technical instructions.
 - Time to prepare.
 - Time to change states of readiness.
 - A sketch of the target, charges, and ignition system.
- Handover/takeover instructions detailing how the target will be turned over to the control of another element. These should include—
 - Target information.
 - Ammunition handed over/taken over.
 - Documentation remaining with the target.

- Documentation prepared for the signatures of commanders handing/taking over the target (prepare in duplicate).
- Demolitions report. A blank copy of this report, to be filled out upon execution of the target, should be in the folder. It should include—
 - Time of demolition.
 - Damage done.
 - Sketch of demolition.
 - Official signature.

Step 2. Prepare the obstacle folder in the language of—

- The units concerned.
- The host nation and either English or French, the two official North Atlantic Treaty Organization (NATO) languages.

EVALUATION PREPARATION

Setup: Provide the soldier with the items listed in the conditions.

Brief soldier: Tell the soldier to prepare a nonnuclear demolition target folder for the specified target.

EVALUATION GUIDE

Score the soldier GO if all steps are properly completed. Score the soldier NO-GO if any step is not properly completed. If the soldier does not properly complete any step, the trainer must show the soldier how to correct the mistake(s). The soldier is expected to review the task steps and performance measures and to practice the task until he performs it correctly.

REFERENCES

Required:

- FM 5-250
- STANAG 2123

Related: None

SECTION III. CONDUCT OF TABLES III AND IV—INDIVIDUAL DEMOLITION AND MINE PROFICIENCY AND QUALIFICATION

Table III is designed to qualify all members of the combat-engineer platoon on demolitions and mines. It is a hands-on, performance-oriented table that requires the soldier to demonstrate proficiency in mine and demolition procedures using inert training aids. Table IV is designed to qualify all members of the combat-engineer platoon using live mines and demolitions. It requires all soldiers to build confidence and proficiency by executing the embedded tasks to the standard provided. All leaders in the platoon are responsible for ensuring that they and their subordinate leaders are qualified in Table II tasks before executing Table III or IV tasks.

FREQUENCY

This table will be executed semiannually. A unit commander may increase the frequency based on his unit's mission and requirements.

EXECUTION

Table III tasks (Table 3-3, page 3-30) may be executed on any available training area using inert training aids. Table IV tasks (Table 3-3) require the use of standard demolitions and supporting ranges.

The following tasks are trained for both Tables III and IV:

- Individual demolition tasks.
 - Constructing a nonelectric initiating system with MDI.
 - Priming explosives with MDI.
 - Priming a shaped charge.
 - Establishing a dual-primed/dual-initiated system (cold weather) with cratering charges.
 - Priming a bangalore torpedo.
- Mine-warfare tasks.
 - Installing and removing AT mines and installing antihandling devices (AHDs).
 - Detecting and marking enemy mines and detecting AHDs.
- Demolition tasks using MDI.

STRATEGY AND CONCEPT

Each squad leader is responsible for his soldiers' conduct and evaluation. He alone is responsible for the proficiency of his assigned soldiers in their individual demolition and mine tasks.

Table 3-3. Tables III and IV tasks—individual demolition and mine proficiency and qualification

Task	Task No.	Page
Locate Mines by Visual Means	051-192-1021	3-31
Recognize and Distinguish Friendly and Threat Mines and Firing Devices	051-192-1045	3-33
Install an M15 Antitank Mine Using an M624 Fuse	051-192-1105	3-34
Remove an M15 Antitank Mine Armed With an M624 Fuse	051-192-1106	3-37
Install an M15 Antitank Mine Armed With an M603 Fuse	051-192-1107	3-39
Remove an M15 Antitank Mine Armed With an M603 Fuse	051-192-1108	3-42
Install an M19 Antitank Mine	051-192-1109	3-44
Remove an M19 Antitank Mine	051-192-1110	3-47
Install an M21 Antitank Mine	051-192-1117	3-49
Remove an M21 Antitank Mine	051-192-1118	3-52
Install the M5 Pressure-Release Firing Device on Antitank Mines	051-192-1154	3-54
Remove the M5 Pressure-Release Firing Device From Antitank Mines	051-192-1155	3-56
Neutralize Booby Traps	051-193-1013	3-58
Construct a Nonelectric Initiating Assembly With Modernized Demolition Initiators (MDI)	051-193-1055	3-61
Prime Explosives Using Modernized Demolition Initiators (MDI)	051-193-1103	3-63
Construct a Dual-Firing System With Modernized Demolition Initiators (MDI)	051-193-1202	3-65

All evaluators undergo an extensive installation/organization demolition/mine certification program (according to Army Regulation [AR] 385-63, local range procedures, and SOPs) before being allowed to evaluate/certify their squad members. Evaluators must integrate all local and Army safety regulations into the tasks.

Squads must maintain integrity during the conduct of each task. An AAR will be conducted with the tester upon completion of the test.

Table IV follows the same strategies and concepts as Table III, as listed above. When live-mine training is conducted, Chapter 6 of DA Pam 350-38 will give the total mines a unit is authorized. Each mine may be used 25 times before it must be detonated. Live demolition authorizations will be taken from Chapter 6 of DA Pam 350-38.